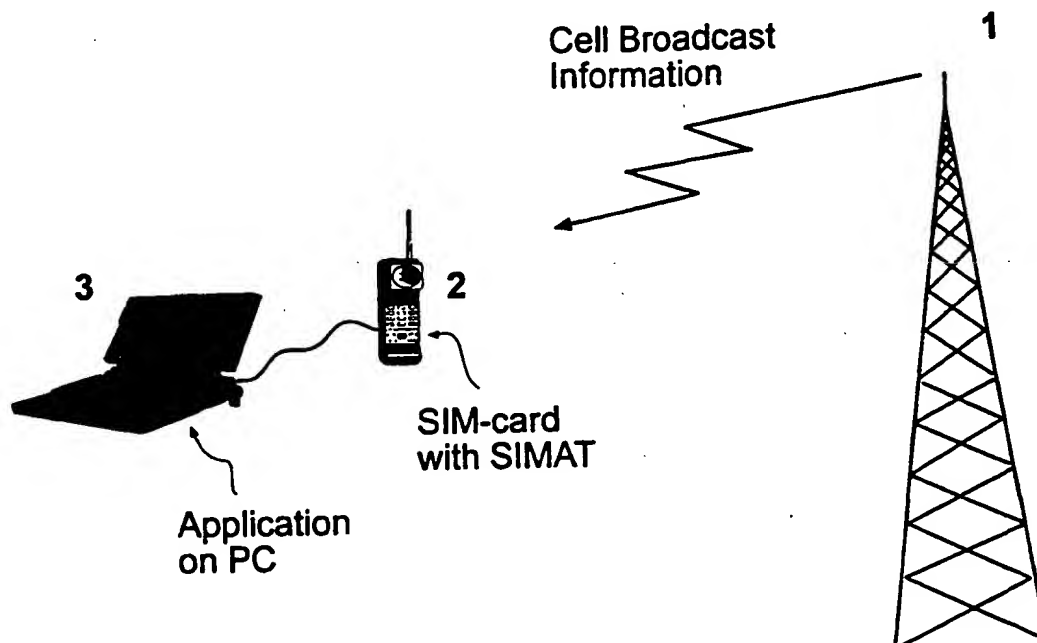


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: H04Q 7/38, 7/32	A1	(11) International Publication Number: WO 99/49690 (43) International Publication Date: 30 September 1999 (30.09.99)
(21) International Application Number: PCT/SE99/00451 (22) International Filing Date: 23 March 1999 (23.03.99) (30) Priority Data: 9800978-0 24 March 1998 (24.03.98) SE (71) Applicant: TELIA AB (publ) [SE/SE]; Mårbackagatan 11, S-123 86 Farsta (SE). (72) Inventors: MAGNUSSON, Peter; Blomstergatan 20, S-653 42 Karlstad (SE). SCHMIDT, Mikael; Orrstigen 10, S-654 68 Karlstad (SE). (74) Agent: PRAGSTEN, Rolf; Telia Research AB, Vitsandsgatan 9, S-123 86 Farsta (SE).		(81) Designated States: EE, LT, LV, NO, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: ADAPTABLE SELECTION OF CARRIER SERVICES**(57) Abstract**

The invention relates to a method at a mobile telephone system which provides that the network/base station can recommend which carrier services, for instance GPRS or HSCSD, that can be used optimally on each occasion, depending on application and current loading on the network, at which the actual decision about which carrier service that shall be utilized is taken by the mobile terminal.

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

TITLE OF THE INVENTION: ADAPTABLE SELECTION OF CARRIER
SERVICES

Field of the invention

5 The present invention relates to a method at a cellular mobile telephone system including a network with a base station and a mobile terminal.

Background of the invention

10 The mobile telephone networks of today have no control over which carrier service the mobile user selects to utilise. This is a problem both to the mobile user and to the network operator. The mobile operator competes about too scarce resources and runs the risk of getting a quality
15 which is experienced as poor, in spite of that there perhaps are other resources in the network which might be used. The network operator has no mechanism to allocate users over different carrier services and cannot optimally utilise his/her network resources, but is obliged to accept
20 the behaviour of the mobile equipment.

 The problem of the mobile telephone networks of today consequently is that the mobile user has to utilise one in advance defined carrier service, in spite of the fact that the mobile user might have considerably larger network
25 resources from the network operator if he/she had utilised any other carrier service.

 The aim of the present invention is to solve this problem.

30 **Summary of the invention**

 This above mentioned aim is achieved by a method at a cellular mobile telephone system which includes at least one network with at least one base station and at least one mobile terminal, at which the network/base station
35 transmits information to the mobile terminal regarding qualities of the network, at which the actual decision

about which carrier service that shall be used is made by the mobile terminal on basis of the from the network/base station transmitted information.

An advantage of the invention consequently is that the mobile terminal utilises the carrier service, for instance HSCSD, GPRS, which is most suited for requested application, respective load in the network.

An advantageous embodiment is described in the patent claim 4, where it can be seen that the network qualities can be stored on a SIM-card.

A simple and practical way of transmitting network information from the base station to the mobile terminal is made by means of Cell Broadcast as can be seen in the patent claim 5.

Further characteristics of the invention are given in the other subclaims.

Brief description of the drawings

In the following a detailed description of the invention is given with reference to the enclosed figures in which:

Figure 1 shows the included components in the cellular mobile telephone system according to the invention.

Figure 2 shows a flow chart according to the invention which describes the function of the mobile terminal.

- A: Start
- B: Wait
- C: Listen for information on the Cell Broadcast Channel.
- D: New Information ?
- E: Store the information on the SIM-card.
- F: Wait
- G: Call from the application on the external Computer.
- H: Call an application on the SIM-card.
- I: Establish suitable carrier.

J: Wait for data from the application.
K: Receive data from the application.
L: Transmit data from the application.
M: Data finished ?
5 N: Disconnect
O: Wait

Detailed description of an embodiment of the invention

In the GSM-systems of today there are a number of
10 carrier services to select from where one is to establish a
data call. One can for instance select between a
transparent (transmission of data without retransmission at
error), or a non-transparent transmission (transmission of
data with retransmission at error) carrier service
15 depending on which type of behaviour one wants of the GSM
carrier service. In most cases, however, the customer who
uses the carrier service does not know that there is a
choice to be made, and neither should he/she need to care
about this. At present there also are few PCMCIA-cards
20 which support all types of carrier services. For most the
non-transparent, asynchronous service functions quite
enough well. Within the next four to five years period of
time, new carrier services probably will be introduced in
Telia Mobile's network. First out is HSCSD (High Speed
25 Circuit Switched Data) which will offer an increased data
rate to the mobile data services. Just as the name
indicates, this is a circuit switched service where one as
user reserves a radio channel for as long as one is
connected, irrespective of if one uses the channel or not.
30 In a few years there will be another new carrier service:
GPRS (General Packet Radio Service). This is a packet
switched service where one only uses the radio channel when
one needs it, and where a multiple of user can share the
radio resources.
35 A packet switched carrier service such as GPRS is well
suited for traffic which has a quality of being "burst-

like", i.e. where the information is coming in short bursts with comparatively long intervals, whereas HSCSD is better suited for traffic, the quality of which is continuous and then is finished, for instance a file transmission. In some cases it can be easy to in advance know what the traffic model looks like, for instance in a taxi firm which uses GSM data services for communication between the exchange and the cars, each car generates a lot of short messages with comparatively long intervals. This is a consequence of the application which the taxi firm uses, and in this example GPRS consequently should be selected as carrier service. It is probably easier to connect a traffic model to a vertical application, which is produced for a specific purpose, than to make the same connection for horizontal applications, for instance Internet browsers, which can be used for a lot of different purposes. To the above mentioned carrier services can be added SMS and USSD, which are suited for quite different applications and services.

The problem is to know how to select right carrier service with regard to traffic model which in its turn is influenced by how the application is designed and how the customer uses this application.

What further complicates the matter is that the optimal selection of carrier service also is influenced by how the resources in the network are allocated and how they are loaded. In the GSM-systems of the future, the different carriers services probably will share the total number of resources, for instance will one resource which on one occasion is reserved for HSCSD to, on another occasion, be reserved for GPRS. The network will be able to dynamically allocate and re-allocate its total resources between different carrier services. How fast this dynamics will be is however not yet evident. On a specific occasion the optimal selection of carrier service for a given traffic model will be, say GPS. On another occasion the optimal selection of carrier service for the same traffic model

will instead be HSCSD. The reason for this may be that the GPRS-resources are so strained that it is a better selection to have guaranteed resources in the form of HSCSD. Further complications will occur when UMTS is introduced. In many areas we will have coverage for both UMTS and GSM, and combined dual-mode terminals which will be able to operate in both systems.

Figure 1 shows a mobile telephone system according to the invention, where the antenna (1) represents the base station which transmits recommendations (Cell Broadcast Information) to the mobile terminal (2). The mobile terminal (2) in Figure 1 utilises SIM-card with SIMAT (SIM Application Toolkit) and is connected to a portable computer (3) (for instance PC) via an interface card, for instance PCMCIA-card.

The network which is controlled by the base station 1 can recommend which carrier services that can be used optimally on each given occasion, but the actual decision is always taken by the mobile equipment 2,3. The invention is based on SMSCB (SMS over Cell Broadcast) and SIMAT (SIM Application Toolkit). At Cell Broadcast, the information can be transmitted to all mobiles 2 in one or more cells. The information is transmitted in form of an SMSCB and can be shown on the display and/or stored on the SIM-card. This invention is based on that the information which is transmitted on Cell Broadcast is received by the mobile terminal 2 and is stored on the SIM-card. This information includes information about the momentary allocation of resources of the network and loading locally for just that cell where the information has been received. When the user of the mobile terminal 2 shall start an application which requires a data connection, a request is made to the SIM-card which can recommend a carrier service which is an optimal choice with regard to selected application and resource allocation and loading in the network. For making the SIM-card able to give such a recommendation is required

that there is one for the purpose intended software stored on the card. This software is specific to the operator and can be downloaded on the card either in connection with that the card is being bound to a person, or via an SMS. It
5 should be understood that this software also can be stored in just any memory in the mobile terminal 2, or in the computer 3. An SMS can be transmitted directly to a user, or to a group of users, by means of Cell Broadcast. Figure 2 below describes in a flow chart how a mobile terminal 2
10 which makes use of the described technology can operate. Figure 2 implies that above mentioned software already exist on the SIM-card.

The shaded boxes in the flow chart in Figure 2 represent the invention. The mobile terminal 2 is initially
15 in the wait-mode and listens for Broadcast Information from the base station 1. When mobile terminal receives Broadcast Information, this is immediately stored on the SIM-card.

When a call from an application on the external computer 3 is made (for instance transmission of a text
20 file from a portable computer 3 to the network 1) an application on the SIM-card is called. This implies that the mobile terminal 2 calls a specific software on the SIM-card with parameters from the application. After that, the SIM-card provides the mobile terminal 2 with information
25 about suitable carrier service. Mobile terminal 2 selects and establishes suitable carrier service towards the network 1. After that, data related to the application is transferred between portable computer 3 and the network 1 by means of selected carrier service.

30 In the following a possible scenario where the invention might be used is given. Kristoffer is on an official business and wants to utilise his e-mailbox. He starts an e-mail application on his portable computer PC3 and connects it to his mobile terminal 2. Normally it is
35 only to establish a connection by a simple keying in the e-mail application, but this time Kristoffer is in a hurry

and selects a higher quality of the intended connection over the GSM-network 1 by an additional selection in the application. Kristoffer has no extensive knowledge of the carrier services. Certainly he has heard about GPRS, but he
5 has no idea of that the application normally uses a "low-performance" so called "best effort"-service over GPRS. Now the application needs to use a carrier service with better performance to provide for Kristoffer's wishes, and normally it would have been sufficient with any other
10 quality profile for GPRS, but just when he is to establish a connection there are a lot of people who want to use GPRS carrier services. This does Kristoffer's mobile terminal 2 know, because it has received information about this in form of short messages (SMS) via GSM's broadcast channel..
15 When Kristoffer finally presses the "set-up connection"-key, his e-mail application transmits a request to the SIM-card which, on basis of the need of the application and the load on the network, selects quite another carrier service, namely HSCSD with 2 time slots. Kristoffer knows nothing
20 about this, but yet he is satisfied because the retrieval of his mail has been rapid.

Finally it can be said that today there are problems of selecting right carrier service for right application.

In a few years the situation will be even more
25 difficult to master, and this invention is a condition for that applications shall have the carrier service which is optimal in each moment.

The above mentioned is only to be regarded as an advantageous embodiment of the invention, and the extent of
30 protection of the invention is only limited by what is stated in the following patent claim.

PATENT CLAIMS

1. Method at a cellular mobile telephone system including at least one network with at least one base station (1) and at least one mobile terminal (2,3),
5 c h a r a c t e r i s e d in that said network/base station (1) transmits information to said mobile terminal (2,3) regarding qualities of said network, at which a decision about which carrier service that shall be used for
10 communication between said network and said mobile terminal is made by said mobile terminal (2,3) on basis of the from the network/base station transmitted information.

2. Method according to patent claim 1,
c h a r a c t e r i s e d in that said information includes
15 information about allocation of resources and loading of said network for the cell where said information has been received.

3. Method according to patent claim 1 or 2,
c h a r a c t e r i s e d in that said information is
20 stored in just any memory in said mobile terminal (2,3).

4. Method according to patent claim 3,
c h a r a c t e r i s e d in that said information is stored on a SIM-card.

5. Method according to any of the previous patent
25 claims, c h a r a c t e r i s e d in that said information is transmitted from said base station (1) by means of cell broadcast.

6. Method according to any of the previous patent claims, c h a r a c t e r i s e d in that software is
30 stored on said SIM-card or in just any memory in said mobile terminal (2,3), which software recommends said carrier service, for instance GPRS, HSCSD, on basis of an application and said information.

7. Method according patent claim 6,

c h a r a c t e r i s e d in that said software is specific to the operator, and is downloaded on said SIM-card at the binding of the card to a person, or via SMS.

8. Method according to any of the patent claims 6 or
5 7, c h a r a c t e r i s e d in that when a user of said mobile terminal (2,3) starts an application, for instance a file transmission, which requires a data connection to said network (1), a request is made to said SIM-card which recommends a carrier service, for instance HSCSD, after
10 which said mobile terminal communicates with said network by means of said carrier service.

9. Method according to any of the previous patent claims, c h a r a c t e r i s e d in that said mobile terminal (2,3) consists of a mobile telephone (2) and a
15 portable computer (3) connected to said mobile telephone, at which said application is started from said portable computer (3).

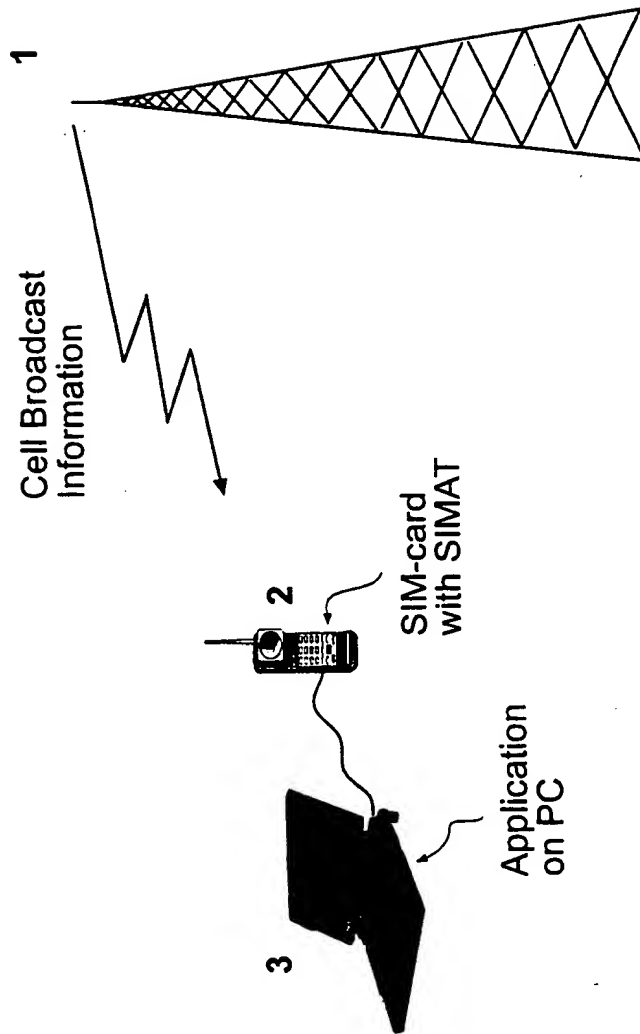
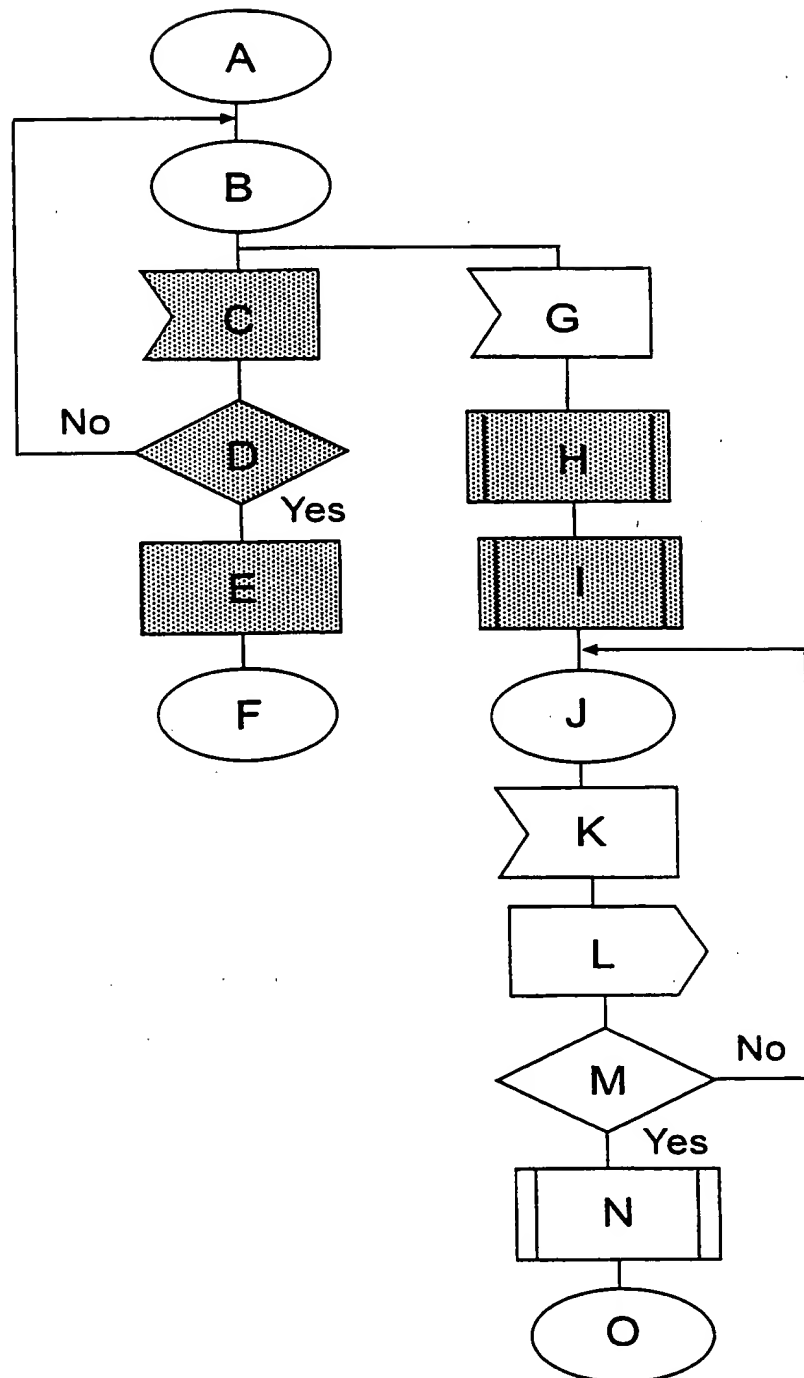


Figure 1

**Figure 2**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00451

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38, H04Q 7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2294844 A (MOTOROLA INC), 8 May 1996 (08.05.96), see the whole document --	1-9
A	GB 2292047 A (MOTOROLA LIMITED), 7 February 1996 (07.02.96) -- -----	1-9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 August 1999

Date of mailing of the international search report

24-08-1999

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Kristina Pederson/cs

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE 99/00451

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2294844 A	08/05/96	AU 700136 B	24/12/98
		AU 3980095 A	31/05/96
		CN 1141111 A	22/01/97
		DE 19581443 T	27/02/97
		FI 962789 A	03/09/96
		GB 9422449 D	00/00/00
		JP 9507986 T	12/08/97
		WO 9614719 A	17/05/96
GB 2292047 A	07/02/96	GB 9415217 D	00/00/00

1/2

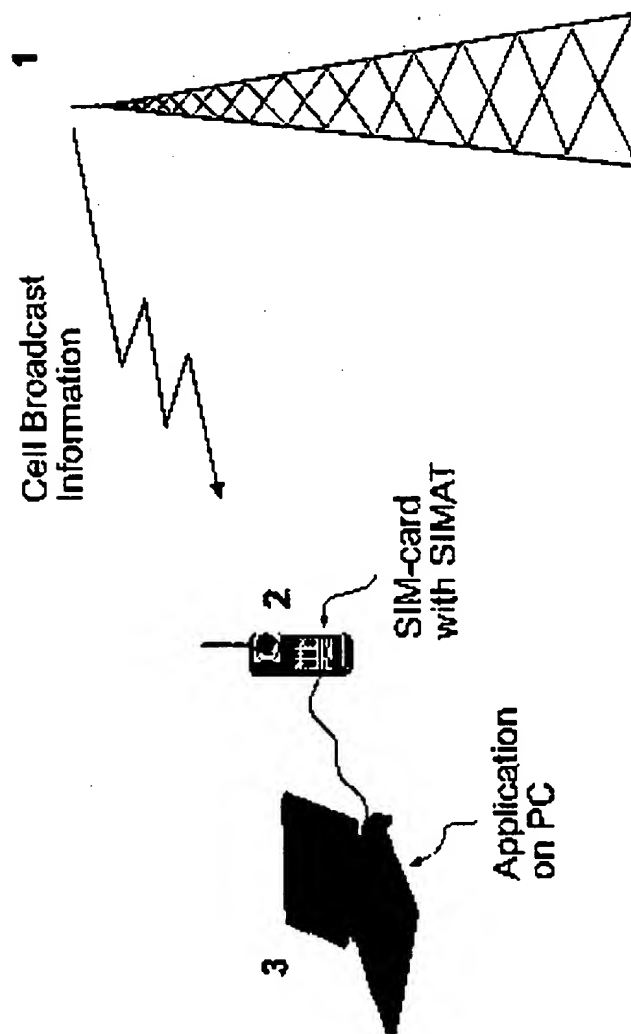
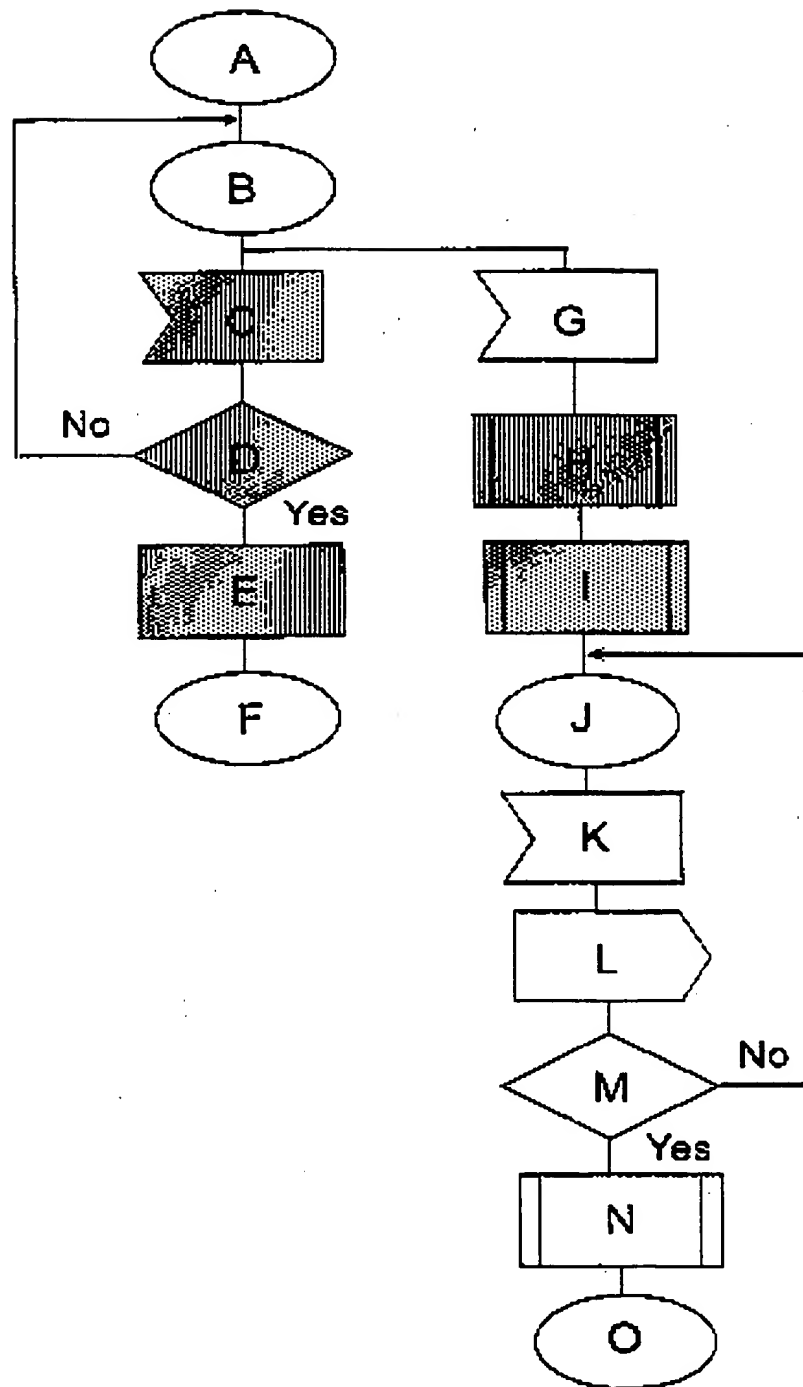


Figure 1

**Figure 2**